Chapter E4: Economic Value of I&E Losses Based on Benefits Transfer Techniques

This chapter presents an analysis using benefits transfer techniques of the economic losses associated with I&E of striped bass at the Pittsburg and Contra Costa facilities in the San Francisco Bay/Delta Estuary. Section E4-1 provides an overview of the valuation approach, Section E4-2 discusses the value of recreational fishery losses, Section E4-3 discusses nonuse values, and Section E4-4 summarizes benefits transfer results. Chapter E5 discusses economic values associated with losses of special status species.

E4-1 OVERVIEW OF VALUATION APPROACH

EPA reviewed I&E data for five fishery species for this valuation analysis (American shad, northern anchovy, Pacific herring, starry flounder, and striped bass) and determined that I&E losses and associated dollar values were only significant for striped bass. In addition, fishing harvest and mortality rates for the other four fishery species are uncertain or unavailable. Therefore, only recreational fishery losses resulting from I&E of striped bass are considered here. In addition, impingement and entrainment of forage species other than special status species were not included in this assessment, since their losses were insignificant relative to concerns about special status species in these waters (discussed in Chapter E5). Because only striped bass was evaluated in the benefits transfer analysis, the results presented here underestimate the value of fishery losses at the two plants.

Because the economic evaluation of recreational yield is based on numbers of fish rather than pounds, the foregone recreational yield of striped estimated in Chapter E3 was converted to numbers of fish for the benefits transfer analysis, as indicated in Tables E4-2 and E4-3. This conversion was based on the average weight of harvestable striped bass. Note that the numbers of foregone recreational fish harvested are lower than the numbers of age 1 equivalent losses, since the age of harvest of most fish is greater than age 1.

E4-2 ECONOMIC VALUE OF RECREATIONAL FISHERY LOSSES RESULTING FROM I&E AT PITTSBURG AND CONTRA COSTA

E4-2.1 Economic Values from the Consumer Surplus Literature

Striped bass are a valuable recreational fish in both Atlantic and Pacific coastal waters. Table E4-1 shows some studies that value additional catch of striped bass and other small game fish. Most studies are from the Atlantic coast and are included for comparison. The study that applies most directly to the San Francisco Bay/Delta Estuary is that done by Huppert (1989). In this study, Huppert found that anglers were willing to pay $58.07 each (in 1999 dollars) per year to avoid a 50 percent reduction in striped bass and chinook salmon catch rates, and $74.79 each (in 1999 dollars) per year to have a 100 percent increase in striped bass and chinook salmon catch rates. EPA used Huppert's (1989) estimates of angling trips per year and current catch rates to estimate anglers' willingness to pay to increase striped bass catch rates by one fish per trip or to avoid a

decrease in catch rates by one fish per trip. The other studies summarized in Table E4-1 find similar values for increased catch rates for striped bass and other small game fish on the Atlantic coast.

Table E4-1: Selected Valuation Studies for Estimating Changes in Catch Rates			
Authors	Study Location and Year	Item Valued	Value Estimate ($2000)
Huppert (1989)	San Francisco Bay, 1985-1986	WTP to avoid a 1 fish per trip decrease in catch rate[a] WTP to have a 1 fish per trip increase in catch rate[a]	Chinook salmon/striped bass $14.14 Chinook salmon/striped bass $9.11
Norton et al. (1983)	Mid-Atlantic coast, 1980	Catch rate increase of 1 striped bass per trip, for New England, mid-Atlantic, and Chesapeake	New England striped bass $26.39 Mid-Atlantic striped bass $15.55 Chesapeake striped bass $11.08
McConnell and Strand (1994)	Mid- and south Atlantic coast, anglers targeting specific species, 1988	Catch rate increase of 1 fish per trip[b] — average over all east coast states	Small game fish $10.40
Hicks et al. (1999)	Mid-Atlantic coast, 1994	Catch rate increase of 1 fish per trip, from historical catch rates at all sites, for all mid-Atlantic coast states	Small game fish $3.36

[a] Average willingness to pay (WTP) per angler per year to avoid a 50 percent reduction in catch ($58.07) or to have a 100 percent increase in catch ($74.79) (average of valuations from a travel cost model and a contingent valuation model). The average angler took 6.2 trips per year and caught 1.36 salmon/striped bass per trip. Therefore, we estimate that an increase of one fish per trip would be worth $8.87 (1.36 fish/trip * 6.2 trips/year = 8.43 fish/year; $75/year ÷ 8.43 fish/year = $8.87/fish). Avoiding a 50 percent reduction in catch per trip would be worth $13.77 ($58.07/trip ÷ 6.2 trips/year ÷ (1.36 fish/trip x 50%)).
[b] Value was reported as "two months value per angler for a half fish catch increase per trip." From 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (U.S. DOI, 1997), the average saltwater angler takes 1.5 trips in a 2 month period. Therefore, to convert to a "1 fish per trip" value we divided the 2 month value by 1.5 trips and then multiplied it by 2, assuming the value of a fish was linear.

E4-2.2 Economic Values Applied to Losses of Striped Bass Resulting from I&E at Pittsburg and Contra Costa

EPA used Huppert's estimates (1989) to calculate the dollar value of I&E-related losses to recreational landings of striped bass. Results for Pittsburg are displayed in Table E4-2 and results for Contra Costa are displayed in Table E4-3. The estimated loss resulting from I&E at Pittsburg ranges from $111,500 to $173,000 per year for impingement, and from $1,259,200 t$1,954,500 per year for entrainment. The estimated loss resulting from I&E at Contra Costa ranges from $136,400 to $211,600 per year for impingement, and from $426,800 to $662,400 per year for entrainment.

Table E4-2: Mean Annual Recreational Losses and Associated Economic Values for Striped Bass at the Pittsburg Facility						
Source	Loss to Recreational Catch Expressed as Pounds of Fish	Loss to Recreational Catch Expressed as Numbers of Fish	Recreational Value/Fish		Loss in Recreational Value from Impingement ($2000)	
			Low	High	Low	High
Impingement	46,911	12,236	$9.11	$14.14	$111,467	$173,012
Entrainment	530,850	138,225	$9.11	$14.14	$1,259,229	$1,954,500

Mon Jan 14 09:01:41 MST 2002 ; TableB: recreational losses and value for selected species; Plant: pittsburg ; type: I Pathname: P:/Intake/Calif/Calif_Science/scodes/pittsburgh/tables.output/TableB.rec.losses.pittsburg.I.csv

Source	Loss to Recreational Catch Expressed as Pounds of Fish	Loss to Recreational Catch Expressed as Numbers of Fish	Recreational Value/Fish		Loss in Recreational Value from Impingement ($2000)	
			Low	High	Low	High
Impingement	57,482	14,968	$9.11	$14.14	$136,354	$211,641
Entrainment	179,921	46,848	$9.11	$14.14	$426,790	$662,438

Table E4-3: Mean Annual Recreational Losses and Associated Economic Values for Striped Bass at the Contra Costa Facility

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E4-3 NONUSE VALUES

Recreational consumer surplus is only part of the total loss that the public realizes from I&E impacts on fisheries. Nonuse, or passive use, impacts occur when individuals value environmental changes apart from any past, present, or anticipated future use of the resource in question. Such passive use values have been categorized in several ways in the economic literature, typically embracing the concepts of existence (stewardship) and bequest (intergenerational equity) motives. Using a "rule of thumb" that nonuse impacts are at least equivalent to 50 percent of the recreational use impact (see Chapter A9 in Part A of this document for further discussion), EPA estimates that nonuse values for striped bass losses at Pittsburg range from $55,700 to $86,500 per year for impingement and from $629,600 to $977,300 per year for entrainment. At Contra Costa, nonuse values for striped bass losses range from $68,200 to $105,800 per year for impingement and from $213,400 to $331,200 per year for entrainment.

E4-4 SUMMARY OF ANNUAL VALUE OF BASELINE ECONOMIC LOSSES AT PITTSBURG AND CONTRA COSTA

Tables E4-4 and E4-5 summarize the estimated annual baseline losses from I&E at the Pittsburg and Contra Costa facilities, respectively. Total impacts range from $167,200 to $259,500 per year for impingement and from $2,056,000 to $3,191,300 per year for entrainment at Pittsburg, and from $204,500 to $317,500 per year for impingement and from $640,200 to $993,700 per year for entrainment at Contra Costa.

Table E4-4: Summary of Baseline Annual I&E Value Losses at Pittsburg Facility ($2000)		Impingement	Entrainment	Total
Recreational (Direct Use, Nonmarket)	Low	$111,467	$1,259,229	$1,370,696
	High	$173,012	$1,954,500	$2,127,512
Nonuse (Passive Use, Nonmarket)	Low	$55,734	$629,615	$685,349
	High	$86,506	$977,250	$1,063,756
Total (Rec + Nonuse)	Low	$167,201	$1,888,844	$2,056,045
	High	$259,518	$2,931,750	$3,191,268

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P:/Intake/Calif/Calif_Science/scodes/contracosta/tables.output/TableE.summary.pittsburg.csv

Table E4-5: Summary of Baseline Annual I&E Value Losses at Contra Costa Facility ($2000)				
		Impingement	Entrainment	Total
Recreational (Direct Use, Nonmarket)	Low	$136,354	$426,790	$563,144
	High	$211,641	$662,438	$874,079
Nonuse (Passive Use, Nonmarket)	Low	$68,177	$213,395	$281,572
	High	$105,821	$331,219	$437,040
Total (Rec + Nonuse)	Low	$204,531	$640,185	$844,716
	High	$317,462	$993,657	$1,311,119

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P:/Intake/Calif/Calif_Science/scodes/contracosta/tables.output/TableE.summary.contracosta.csv